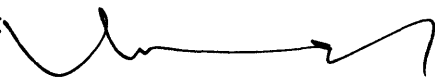
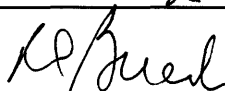


Software Release Notice Acquired Software	
1. Software Name: UDEEC	Software Version: 4.0
2. Software Function: Simulates the response of discontinuous media subjected to static or dynamic loading.	
3. Summary of Actions: <input type="checkbox"/> New Software <input checked="" type="checkbox"/> Update to Existing Software <input type="checkbox"/> Software Retirement	
4. Software Installation	
4a. Computer Platform(s): PC 4b. Operating System(s): Windows 2000 4c. Programming Language(s): FISH	
4d. Installation Testing: <input checked="" type="checkbox"/> Passed Testing Performed On: <u>Loth by A. Ghosh</u> Description of Testing Performed: Software was installed on a Windows 2000 operating system. <u>See attached</u>	
4e. Archive Copy: <input checked="" type="checkbox"/> Enclosed <input type="checkbox"/> Not Available, Why:	
Installation Performed by: IMS	Date: 2/2005
Remarks:	
5. Software Assessment	
Validation Status: <input type="checkbox"/> Full Validation <input type="checkbox"/> Limited Validation Date of Validation: <input checked="" type="checkbox"/> Not Validated, Explain: There is no current plan to use them in YM and any other NRC sponsored project. Potential use will be WFO. If there is a plan to use for NRC projects, we will validate them.	
Software User: <u>A. Ghosh</u>	Date: <u>February 16, 2005</u>
Remarks:	
6. Approval	
Manager: 	Date: <u>2-16-05</u>
Remarks:	
7. QA Verification	
SRN Number: <u>364</u>	
	Date: <u>6/27/2005</u>
Remarks:	

Installation Test for Acquired Software UDEC Version 4.00

Note: *There is no current plan to use UDEC Version 4.0 for any high-level waste related work. Therefore, this version will be under configuration control and will not be validated unless there is a change in the plan.*

Itasca Consulting Group, Inc. Minneapolis, Minnesota, is the developer of the UDEC version 4.0 software. Itasca provides the list of files that would be in the specific subdirectories. Appendix A provides the file structure recommended by Itasca and the file structure when installed on the CNWRA computer "loth." It should be mentioned that all Itasca software are controlled by hardware locks. We are free to install all Itasca codes on any personal computer; however, to make any meaningful analysis, a user needs the hardware lock installed on the specific computer being used.

As a part of the software package, Itasca also supplies files necessary to run an installation test. This test has been designed to verify that the UDEC code has properly installed on a specific computer. These files are TEST1.DAT, TEST2.DAT, and TEST3.DAT, as given in Appendix B. User's Guide of UDEC code (version 4.0) provides the expected output from TEST1.DAT and plot from TEST3.DAT. Expected results, as given in the User's Guide, and actual results after running the files on "loth" are also given in Appendix B. Results given in Appendix B show that the UDEC code has passed the installation test, as specified by Itasca.

Additional Tests:

Several other problems given in the manual "Verification Problems & Example Applications" were run as a part of this exercise, as described below:

1. Response of an Unlined Circular Tunnel in a Biaxial Stress Field

A circular tunnel is subjected to a non-hydrostatic stress field (static). The medium surrounding the tunnel is assumed to be an elasto-plastic medium with failure defined by a Mohr-Coulomb yield function. The dilatancy of the failed rock is defined by the flow rule characterized by the dilatancy angle. Both fully dilatant and non-dilatant behavior of the failed rock have been analyzed. This test specifically addresses the ability of the UDEC code to simulate plastic flow accurately. A comparison with an analytical solution has been conducted.

Input files as well as expected results, as specified by Itasca, are given in Appendix C. Results and plots obtained after running the code at CNWRA are also given in Appendix C.

2. Crack Sheared by Reduced Frictional Strength

This problem calculates the total shear displacement that occurs along a crack when the crack slips. In this problem, crack slip is initiated by reducing the friction of the crack surfaces. Input files as well as expected results, as specified by Itasca, are given in Appendix D. Results and plots obtained after running the code at CNWRA are also given in Appendix D.

3. Seismic Induced Roof Collapse

This problem calculates the collapse of the opening roof when subjected to a seismic load. The

model developed is based on the configuration of the 34-1-554 over-cut at the Fraser Mine, Falconbridge Limited, Sudbury, Ontario. Two continuous joint sets intersect the plane used for analysis. Input files as well as expected results, as specified by Itasca, are given in Appendix E. Results and plots obtained after running the code at CNWRA are also given in Appendix E.

4. Flow from a Borehole in a Biaxial Stress Field

A borehole has been excavated in a rock mass with two orthogonal joint sets and is subjected to a biaxial in situ stress field. A fluid is injected into the borehole at a constant rate. The purpose of this problem is to investigate the influence of in situ stress field on flow through the joints. Input files as well as expected results, as specified by Itasca, are given in Appendix F. Results and plots obtained after running the code at CNWRA are also given in Appendix F.

5. Blocks Bouncing Down a Slope

In this problem, a rock block bounces down the a slope which is generally designed with berms or benches to catch any falling debris. This is an example of a chaotic system where the final results are highly dependent on initial conditions, such as block size, shape, location, and properties, and also on the time step used in modeling. Input files as well as expected results, as specified by Itasca, are given in Appendix G. Results and plots obtained after running the code at CNWRA are also given in Appendix G.

Conclusions:

Based on the results running the installation test problem and several additional problems, it may be concluded that the UDEC code (version 4.0) is running as intended.